Surveillance system for forest fires

Software Requirements Specification -1.0

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Group O

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Document Approval

The following Software Requirements Specification has been accepted and approved by the following:

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1. Introduction

A surveillance system is required to be developed for detection of forest fires in the Melghat Tiger Reserve. The system is based on numerous IOT devices spread across the area of the forest which communicate with neighboring IOTs to alert the security desk, in the case of a fire. For detection, the IOTs would have to be equipped with a number of sensors that will decipher the situation through a dataset already programmed, thus predicting the possibility of a fire.

1.1 Purpose

The aim of this document is to specify the complete description of the project on Surveillance of forest fires. This document describes the functionalities, hardware, attributes and the constraints of the system which will be developed as part of this project. It is intended to be used by members of the project team that will implement and verify the correct functioning of the system. The client can also use this document to verify the fulfillment of his/her/their requirement.

1.2 Scope

1. The product-"Forest Fire Surveillance System" will detect the presence of a forest fire and will send the location of incident through an interconnected network of IOTs to alert the security desk.

2. The hardware system would form a network for communication with each other and the Security station
    a) It will not calculate the location in a cascading manner but will store it as a database.
    b) It will try to optimize the signal path from the IOT device to the security station.
    c) It will try to optimize power usage of the IOT devices by sleep and wake cycles.

3. The following perks of this solution are significant
    a) Not calculating location in a cascading manner would help to minimize the error.
    b) Overtime the location-database map can be updated economically.

1.3 Definitions, Acronyms, and Abbreviations

IOT - The Internet of Things (IOT) in the paper refers to the Arduino/Raspberry pi devices that will be used to create a network.

Arduino - Arduino consists of a physical programmable circuit board (often referred to as a microcontroller) and a piece of software.
Node - A node would consist of an Arduino equipped with sensors
MySQL: It is an open-source relational database management system.

1.4 References

IEEE Software Engineering Standards Committee, "IEEE Std. 830-1998, IEEE Recommended Practice for Software Requirements Specifications", October 20, 1998.

2. General Description

2.1 Product Perspective

Surveillance systems for forest fires based on drones have been made. Image recognition systems have also been used for the purpose. Since the number of image recording devices deployed are generally low in number, there is a possibility of developing a fault that may not be detected for quite a long period of time. The idea of IOTs, thus even in case of such faults provides accurate results still.

2.2 Product Functions

1. The product will have a number of sensors to detect the conditions of the environment and predict if there is a fire.
2. All the IOTs will be able to communicate with other IOTs within their communication range and exchange data if and when required.
3. A sleeping mechanism to conserve and prolong the battery life of the IOTs would be established.
4. Such a network would be able to efficiently exchange information with the security station

2.3 User Characteristics

The only users of this system would be the security personnel. Certain staff may have admin access to some of the features.

2.4 General Constraints

2.5 Assumptions and Dependencies

1. The period of time for which the system would be able to actively perform the function of sensing the fire would depend on the length of the battery life. Although, sleep and

wake cycles would be used to extend the lifetime of the IOTs, the system could suffer after a certain period.
2. It is assumed that the IOT's would be able to correctly transmit the signal even in adverse weather conditions.

3. Specific Requirements

3.1 External Interface Requirements

3.1.1 User Interfaces:

3.1.2 Hardware Interfaces:

1. IOT devices (Arduino/raspberry pi) equipped with sensors and modules
2. Sensors:
    a) Smoke
    b) Humidity
    c) Infrared
    d) Temperature
3. Wi-Fi Module
4. Location Calibration device

3.1.3 Communications Interfaces:

For the implementation of our model, the organization requires a functional lab with all the machines having Wi-Fi connectivity locally.

3.2 Functional Requirements

1. The IOT's should have the ability to communicate with the other devices.
2. The Arduino/raspberry pi devices should have sleep and wake cycles to minimize the waste of battery life.
3. The sensors should be able to continuously communicate the data correctly with their parent Arduino/raspberry pi for smooth communication between devices.
4. The signal sent to the security helpdesk should follow an optimized shortest path.
5. The analysis of the dataset collected by the sensors in the affected region must be efficiently processed to provide real time state of the nearby environment of the node.

3.3 Classes/Objects

3.4 Non-Functional Requirements

3.4.1 Performance:

1. An interface could be provided for the IOT map formed to further the ease of usage of the product.
2. Since the system is database based, the server/servers should be capable of handling large number of simultaneous requests. Thus the bandwidth should be as high as possible to handle the large number of requests.

3.4.2 Reliability:

1. The location calibration device should create a map more often to reduce the error might occur due to IOTs losing their original position.

3.4.3 Availability:

The system should be up and running as much as possible so that there is no problem during the fire or any other external weather interference.

3.4.4 Maintainability:

The dataset should be dynamically updated over a period of time, so that we can analyze the probability of a particular region in the forest catching fire.

3.5 Inverse Requirements

The system shall not provide inaccurate data for a certain period after calibration of the IOT map.

3.6 Design Constraints

Due to the high cost of the sensor-IOT setup the number of devices deployed would have to be minimized which would in turn lower the accuracy.

3.7 Logical Database Requirements

Since the database collected over time would be huge, the server storage would be quite high, a lot of cloud/server storage would be required.